Improving Construction Productivity
Practical insights from pilot site studies

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Front cover image: 1 Broadgate

Foreword

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The construction industry is no stranger to complexity. Every project is a balancing act—of time, cost, quality, and safety; delivered in environments that are often unpredictable and always unique. Yet amid this complexity lies a powerful opportunity to make productivity not just a goal, but a habit.

For this reason, the Construction Productivity Taskforce (CPT) was established in 2020. It comprises leaders from across the construction industry—including clients, contractors, consultants, and supply chain partners to explore and trial practical ways to improve sector productivity.

'Improving construction productivity: Practical insights from pilot site studies', is our third publication to date and follows on from our published research reports; 'Measuring Construction Site Productivity: A seven-step framework for success'[1] and 'Trust and Productivity: Private sector construction playbook'[2]. It continues the thought leadership work of the CPT focussed on driving productivity improvement in the construction industry. The use of pilot sites to develop consistent approaches to the collection and analysis of productivity data is one of three workstreams identified as key to making a step change improvement in the industry. The others being 'design for productivity' and 'training for productivity' about which we will be sharing more information soon – watch this space!
This document is a testament to what is possible when we use measurement and data analysis techniques to drive consistent outputs and incremental productivity improvements and stop accepting unproductive variability on construction sites as inevitable and start treating it as a challenge we can solve."

Through the work of the CPT and the commitment of our pilot project teams, we've shown that with the right data, tools, and mindset, we can build smarter, faster, and more sustainably.

What's most exciting is that these aren't theoretical solutions — they're practical, proven interventions. From early supply chain collaboration to digital planning tools and committed leadership, the lessons captured here are ready to be applied on real projects.

The findings from three diverse pilot sites—Broadgate, Timber Square, and the Vehicle Storage Support Programme—demonstrate how integrated design planning, digital technologies, and localised logistics can significantly reduce unproductive variability and improve output. These projects also highlight the importance of short-term production control, offsite manufacturing, and transparent stakeholder engagement in driving measurable gains.

This is not only an observational report but can be a roadmap which reflects our critical thinking and proven results that we hope the entire industry will consider and adopt. Improving productivity isn't just about better buildings in design and construct, it's about creating a sustainable sector and strong, predictable infrastructure for us all.

Executive summary

This paper consolidates findings from recent on-site productivity measurement studies conducted by the Construction Productivity Taskforce across three major UK construction pilot sites. It identifies key disrupters and enablers impacting productivity and showcases how data-driven approaches combined with advanced digital tools and collaborative planning can transform project delivery outcomes.

These three pilot study sites follow on from the Phase 1 pilot site studies which informed our earlier publication on this subject '<u>Measuring Construction Site Productivity: A seven-step framework for success</u>'(Construction Productivity Taskforce 2022)[1].

The emphasis is on providing industry practitioners—clients, contractors, designers, and supply chain partners—with actionable recommendations and practical frameworks to implement immediately to drive efficiency gains on future projects. Key steps to higher productivity include comitted leadership, early supply chain involvement in design, maximising workflow effectiveness, minimising unproductive processes and production variability, and the innovative use of digital technologies to track and measure on-site performance metrics.

Audience

Construction industry leaders and stakeholders including clients, project managers, designers, cost consultants, main contractors, construction managers, sub and trade contractors and supply chain partners.

The aim is to foster greater predictability and efficiency by enabling stakeholders to implement targeted interventions based on verified evidence.

Introduction

Construction productivity has stagnated relative to other sectors despite the need to respond to increasing complexity of design and mounting pressures to deliver smarter, greener projects on time and budget. This paper shares learnings from pilot sites that applied innovative measurement frameworks and a range of digital technologies to identify root causes of delays and variability.

The purpose of this paper is to empower project teams to adopt proven strategies informed by real-world project data, enabling more predictable delivery outcomes and continuous improvement.

Background

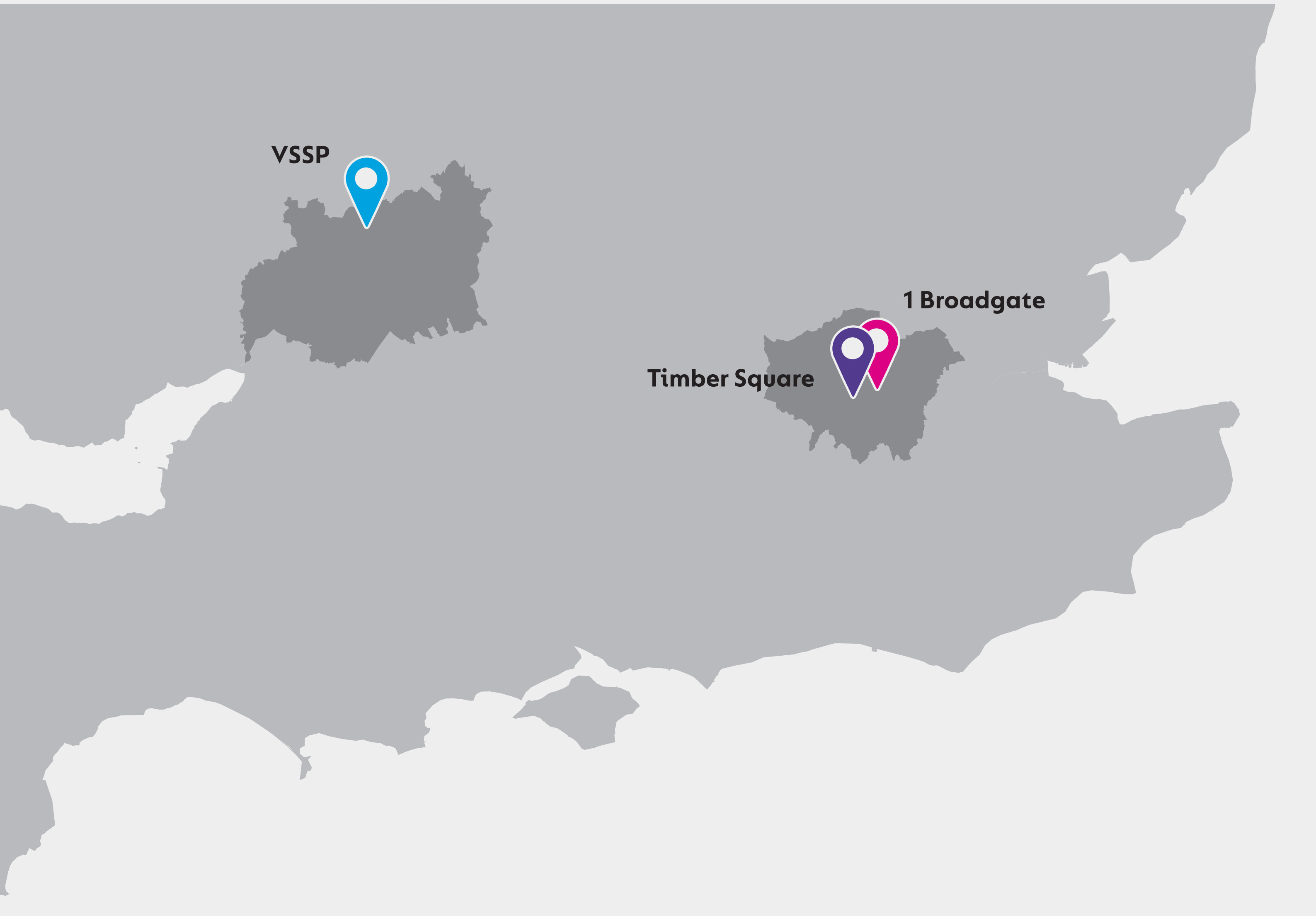
The Construction Productivity Taskforce's Pilot Sites workstream was established to improve UK construction productivity through real-time data-driven analysis of live projects.

Phase 1 established the foundational 'Measuring Construction Site Productivity: A seven-step framework for success' (Construction Productivity Taskforce, 2022)[1].

Phase 2 builds upon this foundation, employing a range of advanced digital technologies to capture unproductive time, identify variability in production outputs, and expose root causes of productivity disruptions. The aim is to foster greater predictability and efficiency by enabling stakeholders to implement targeted interventions based on verified evidence.

Overview of pilot sites

Three major projects were studied during Phase 2. For each of these projects, more detailed case studies describing the specific details of the productivity analysis undertaken on each site are also available:



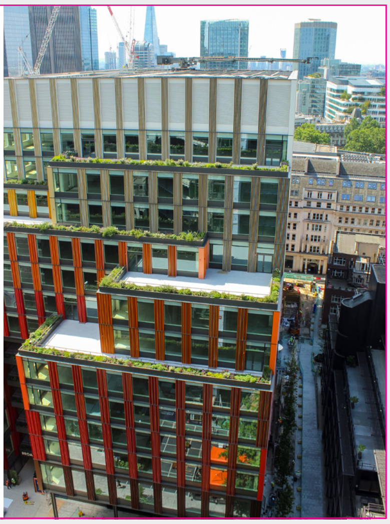
Case study #1:

1 Broadgate, London[3]

Client: **British Land**
Main Contractor: **SRM**

A £300m complex central London commercial and retail project, characterised by dense urban constraints requiring sophisticated logistical coordination and multi-disciplinary design collaboration. The study analysed productivity for in situ concrete frame (specifically slipform) and unitised façade panel operations.

Link to case study: https://bit.ly/1Broadgate



Case study #2:

Timber Square, London[4]

Client: **Landsec**
Construction Manager: **Mace**

A £275m commercial office development comprising two buildings, 'Print' and 'Ink'. The buildings feature a hybrid superstructure combining steel and cross-laminated timber (CLT). The study analysed productivity relating to the installation rates for structural steelwork and CLT components. The project team is also collecting data on facades, lifts, washrooms, and MEP fit-out packages which is part of an ongoing productivity study that will be the subject of a future publication.

Link to case study: https://bit.ly/TimberSquare

Case study #3:

Vehicle Storage Support Programme (VSSP), Tewkesbury[5]

Client: **Defence Infrastructure Organisation**
Main Contractor: **Skanska**

A £259 million public-sector redevelopment for the British Army's vehicle storage and maintenance operations. The study focuses on productivity analysis of the structural steel frame operations, together with a study on the benefits of integrated design planning to deliver design for productivity.

Link to case study: https://bit.ly/VSSPCaseStudy

Key findings from pilot sites

Over the course of these studies data was collected identifying the key enablers and disrupters impacting on productivity, together with the subsequent impact on the variability of production output.

1 Productivity enablers

Planned production outputs were surpassed through **early collaboration with supply chain partners**, which enhanced the design intent by focusing on buildability, programme sequence and fostering a 'design for construction' mindset.

At **1 Broadgate** Morrisroe was involved 9 months prior to construction of the concrete frame, enabling design for buildability input on the slipform approach and a 2-week schedule gain.

At **Timber Square**, the level of crane utilisation was between 60-80% with a few occasions at 90% or more. Lower usage/allocation was associated with lower productivity. The project team monitored the utilisation levels closely throughout the installation period using 1Guava. The data prompted the team to push the installation contractor for additional resource to fill extended working hours periods and increase resource at critical times to complete secondary tasks to maximise the use of the crane.

Adopting **integrated design planning** tools and techniques to provide logic linked and co-ordinated design programmes, enabling design production control to be managed on a 2-week lookahead basis like construction.

A digital design planning tool was adopted on **VSSP**, that enabled transparency in design reporting. This was based on managing 2-week lookahead workplans allocated to each designer. Using this tool the project was able to better control the delivery of design to the agreed programme and maximise design productivity.

FIGURE 1: Examples of the digital technologies deployed across the three pilot sites

Datascope Turnstile monitoring, material deliveries, hot works permits	**Mataman data output from William Hare** Status of steel both on & off site	**Lobster Site Cameras** Camera covering each building	**Buildots/ Disperse** Photo records, comparison to model & progress rate	**Q-Flow & Optimise** Material deliveries
Weather Monitoring Weather data, weather API & visual crossing	**Site diaries & drawing mark ups**	**Water & electricity metered**	**Dome Group** Commissioning ATPs	**QSO & QHP** Quality sign off
	Flow Integrated design planning	**Sipralis** Track & trace for cladding	**Alimak Group** Hoist data	**Construction Programme**
ACC – Autodesk Construction cloud, BIM & snagging	**1Guava** Crane & hoist monitoring	**Site Eye** Time-lapse recording	**Cemex Go App** Precise delivery timing	**Disperse** Progress monitoring

Integrating digital technologies into the data measurement, collection, and analysis processes, delivered operational efficiencies, transparency, and accuracy of outputs.

On all three sites, a range of digital technologies were used, as detailed in Figure 1 to drive greater efficiencies into the design and delivery process. For example, the Cemex Go App was used to facilitate precise delivery timing, enabling immediate response to lorry arrival, thereby improving pour timings, and enhancing productivity. Other technologies, such as Disperse for progress monitoring, Site Eye for time-lapse recording and Datascope for turnstile access control, were implemented to enhance site management and coordination.

Deployment of localised site-specific **construction sequencing solutions** to reduce dependency on the site tower cranes and increasing opportunity for simultaneous working across multiple work areas.

At **1 Broadgate,** the implementation of a localised construction sequencing solution enabled a floor-by-floor façade assembly line. This system used a hoist for vertical distribution and a spider crane to position cladding units at their installation points, resulting in a 140% improvement in output compared to the crane-dependent strategies.

Timber Square had on average 11–15 workers in the superstructure install team per building, delivering third quartile performance of 58 m^2/day and three instances above 70 m^2/day. In terms of labour productivity, both buildings exceeded the current benchmarks for the 11–15 workers group. This higher labour efficiency was likely due to the steel/CLT hybrid structural design, which did not require steel fixers or concrete gangs to create the floor slabs.

2 Productivity disrupters

All three studies identified a wide range of productivity disrupters that need to be considered in the planning and sequencing of construction.

At **Timber Square**, a standard reporting schedule developed by the University of Cambridge, was adopted in the site diaries to record productivity disrupters.

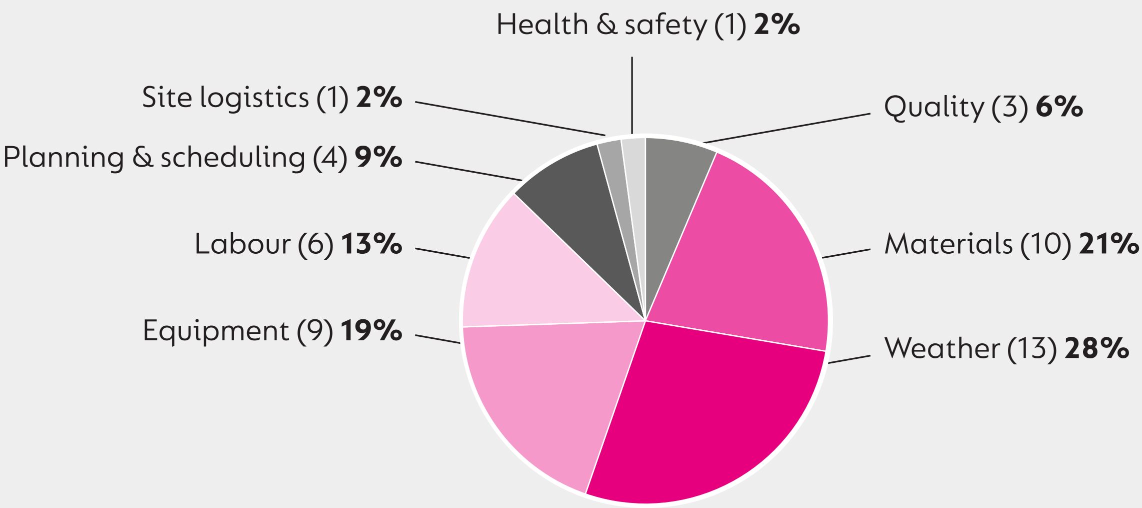
A summary of their findings is shown in Figure 2.

Variability in production outputs

Productivity disrupters resulted in a range of production output variability across all three projects. This variability was mitigated by using short/medium term production control techniques, helping to improve communications and co-ordination of the works sequencing to reduce the disrupters. Examples include:

- Structural steel installation piece count fluctuated by nearly 50% over typical weeks at **VSSP**, due to crane availability limits, weather interruptions, or material logistics challenges (see Figure 3).
- **Timber Square's** use of one dedicated and one shared crane for each site led to inconsistent production rates across floors due to active reprioritisation of site resources to meet evolving project demands, as shown in the example crane utilisation and production rate chart (see Figure 4).
- **1 Broadgate's** constrained site access mandated active reprioritisation and rescheduling of deliveries and trades, causing output inconsistency (see Figure 5).

FIGURE 2: Delay cause analysis from site diaries: Summary of the productivity disrupters recorded at Timber Square (Timber Square[4])



Period: 26/07/2023 ~ 15/11/2024
No. of site diary records: 512
No. of issues recorded: 47

Weather-related delays

Wind sensitivity remains a major disrupter to high-rise structural frame and cladding productivity. Sites using tower cranes are particularly susceptible, as operations are typically suspended above 38 km/h wind speeds. This risk can be mitigated by adopting alternative lifting solutions and localised site-specific construction sequencing that rely less on a tower crane.

Tower crane dependency

Tower crane dependency is not only a logistical bottleneck but a structural constraint on productivity that must be overcome through application of advanced logistics solutions to maximise construction efficiency.

At **1 Broadgate**, the application of localised site-specific construction sequencing enabled the need for a tower crane to be completely bypassed. This enabled up to three active installation floors simultaneously, with floor cycles reduced to 3–4 weeks and installation rates frequently reaching 26-38 units/day. This approach also mitigated the impact of adverse weather, allowing installation to continue with minimal disruption.

FIGURE 3: Example production variability in the steel erection activities at VSSP, based on crane usage (VSSP[5]). Source: University of Cambridge.

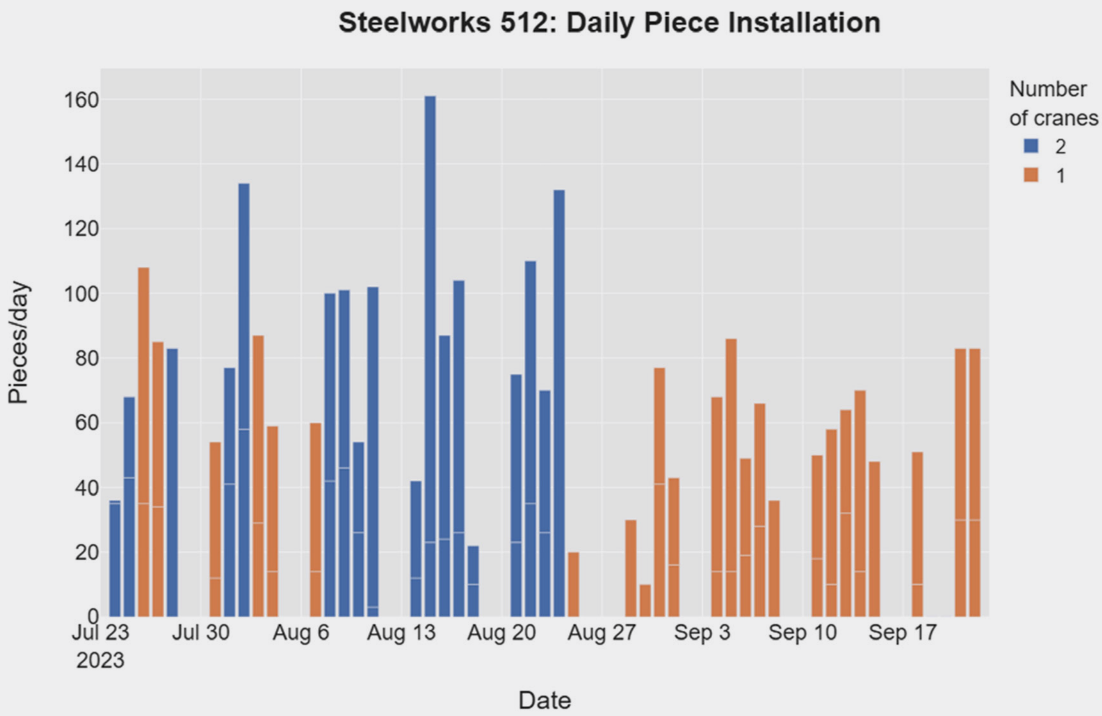


FIGURE 4: Timber Square crane utilisation and production rate charts (Timber Square[4]). Source: University of Cambridge.

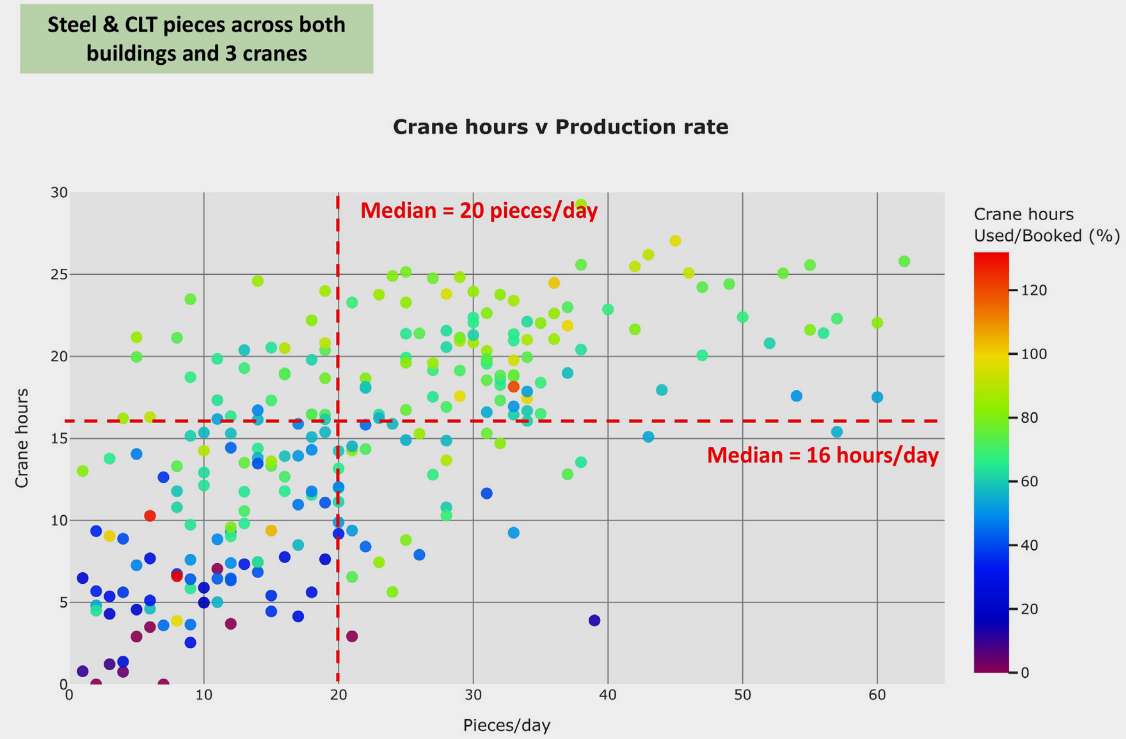
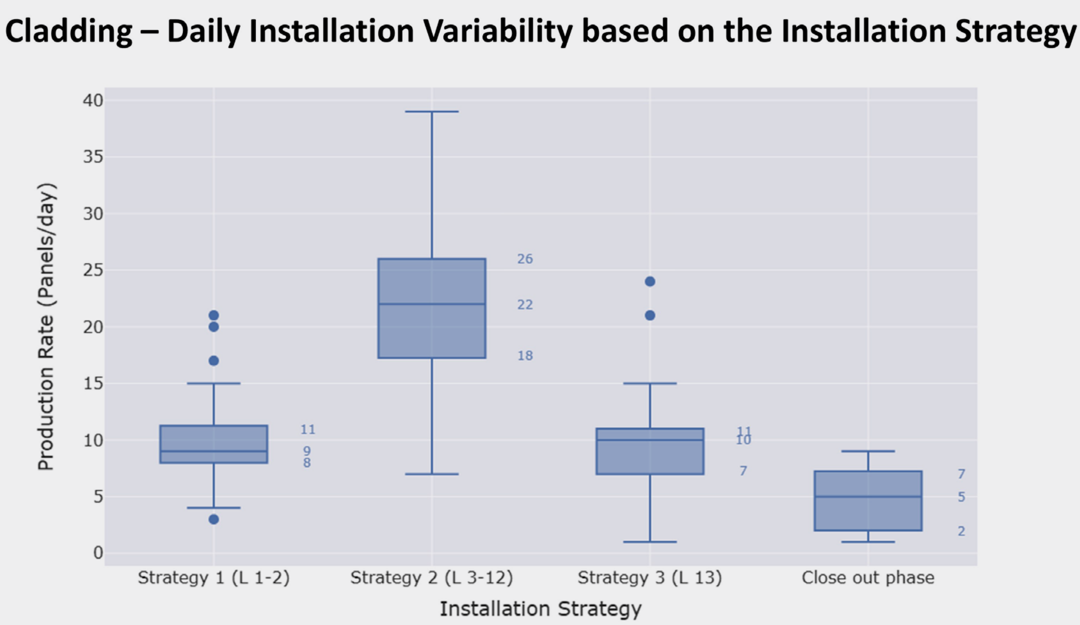


FIGURE 5: An example of cladding production rate variability at 1 Broadgate based on the use of different construction sequencing scenarios (1 Broadgate[3]). Source: University of Cambridge.



	1BG (levels 1-2)	1BG (levels 3-12)	1BG (level 13)	1BG (Close out)
Number of panels	406	1884	149	257
Avg daily number of workers	26	55	63	69
Avg labour productivity (panels/wh)	0.04	0.05	0.02	0.01
Avg production rate (panels/day)	9	22	10	5

Practical recommendations

Proven learning

1. Foster a culture of trust and open data sharing across the supply chain, underpinned by strong commitment from senior leadership. Build trust through transparent communication across the supply chain that explains the purpose of productivity data collection and highlights its mutual benefits—focusing on collaboratively identifying challenges rather than assigning blame.
2. Early supply chain collaboration in design phases. Early engagement with supply chain partners is critical for ensuring certainty in design delivery, optimising off-site prefabrication opportunities and on-site buildability, and aligning construction methods with project timelines.
3. Adopt collaborative planning tools aligned with supply chain capacities. Implement 'last planner system' principles within digital platforms for short-to-medium term scheduling in both the design and construction stages of the project. This improves communication about upcoming tasks between planners, contractors, and suppliers ensuring realistic workflow commitments and minimising scheduling clashes.
4. Leverage digital technologies for real-time visibility. Deploy technologies such as access control systems, crane telematics, AI-driven photographic mapping, IoT sensors, digital tracking technologies and BIM-enabled collaboration platforms. These provide granular insights into labour presence, equipment utilisation, progress tracking, and design coordination – enabling early identification of productivity disrupters and empowering timely mitigation actions.

New learning

5. Assess site area specific construction sequencing to mitigate dependency on tower cranes availability, or similar heavily used plant and equipment. The application of site areas specific construction sequencing can decouple installation from tower crane dependency and enables concurrent work across multiple floors, mitigating weather related delays.
6. Maximise off-site manufacturing & modularisation. Increase use of prefabricated components (e.g. CLT floor panels and other modular assemblies). Offsite manufacturing reduces onsite labour dependencies that are vulnerable to weather or workforce variability, while improving quality control.
7. Tailor urban site strategies for complex environments. In addition to the application of site area specific construction strategies consider the use of consolidation centres, reusable delivery containers (to reduce lay down space and minimise packing waste) and integrated workflow strategies.

How to use the learnings from this paper

Set up measurement frameworks early

Use the seven-step framework developed by the Construction Productivity Taskforce as a starting point for defining – what data to collect; labour volumes; progress images; equipment usage and how to analyse it.

Select appropriate digital tools

Evaluate your project's complexity and resource constraints, then deploy suitable digital systems for access control, telematics, daily diaries and progress imaging etc. Ensure integration between the systems where possible to minimise manual input and enable holistic visibility.

Engage all stakeholders continuously

Communicate the purpose of productivity measurement clearly from project inception. Involve all the key stakeholders including clients, contractors, designers and suppliers in proactive collaborative problem solving based on shared data insights rather than disconnected reactive actions based on isolated silos of information.

Apply pilot site learnings

Adapt lessons such as early buildability reviews at 1 Broadgate and VSSP or crane scheduling optimisation at Timber Square into your planning processes; use alternative lifting solutions and localised site-specific construction sequencing techniques exemplified at 1 Broadgate as standard practice to improve production outputs.

Commit senior leadership support

Ensure executives understand the value proposition of productivity measurement initiatives, so that they champion the cultural change necessary for sustained success.

Conclusion

By embracing the practical recommendations outlined in this paper (grounded in rigorous pilot project research), industry stakeholders can significantly improve construction site productivity outcomes.

Key success factors include:

- adopting collaborative short-term planning tools aligned with supply chains
- deploying integrated digital technologies offering real-time operational visibility
- embedding offsite manufacturing strategies
- fostering transparent stakeholder engagement
- conducting early design buildability reviews
- tailoring logistic strategies for complex urban sites
- consistently measuring productivity metrics
- clear communication of progress and issues through visualisations of KPIs e.g. flowlines.

The practical recommendations on page 13 equip project teams with the tools to reduce unproductive variability, minimise re-work, accelerate workflows and deliver projects more successfully in today's challenging market conditions.

Reflections from CPT members

In the 3 years since 'Measuring Construction Site Productivity: A seven-step framework for success'[1] was published, which featured case studies from the Phase 1 pilot sites, it has been interesting to see the progress made in adopting the recommendations of this publication over that time. Feedback from Construction Productivity Taskforce members can be summarised as follows:

Positive improvements

- There has been rapid adoption and expansion of digital data capture technology over the last 3 years. Notable examples include crane and hoist telematics, site cameras, 3D photographic mapping, AI progress tracking and programme mapping.
- Great progress is being made in acquiring and analysing productivity data from site but at the moment the process is still predominately retrospective providing lessons learned for the future rather than actionable insights. However, the technology is available to move to real time (or near real time) reporting and analysis enabling project teams to spot problems early, model potential impacts and develop recovery strategies based on productivity improvements to get back on track.

Room for improvement

- The principal contractor or construction manager and most supply chain contractors collect progress data in some form, but the methodologies used are inconsistent both within and between organisations and the data is often not shared.
- There are great benefits to be gained through better cooperation on progress and productivity measurement and data capture between the parties – adopt one version of the truth with agreed measurement frameworks to avoid duplication of effort.
- Suppliers using higher levels of offsite manufacturing and modern methods of construction are more advanced in their use of digital tracking technology, production and productivity measurement, workflow, and logistics planning.
- Although tracking materials and equipment is becoming more common, more work is needed to gain the trust of the workforce to allow anonymous people tracking technology to determine time spent in productive and non-productive areas.

With a diminishing construction workforce in the UK and the workload for infrastructure and building projects forecast to increase substantially over the next 10 years the case for higher on-site construction productivity levels is compelling.

We hope the publication of these Phase 2 pilot site case studies, when read in conjunction with the Phase 1 work, will provide a platform for wider adoption of on-site construction productivity measurement and a greater willingness for the industry to share their data to enable the benchmark performance metrics needed to underpin a culture of continuous improvement to be created.

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Dr Ashan Asmone, Research Associate, Laing O'Rourke Centre for Construction Engineering & Technology, University of Cambridge.

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3 1 Broadgate – Pilot Site Case Study. (https://bethebusiness.com/our-thinking/construction-productivity-taskforce-1-broadgate-pilot-site)

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Further reading

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